I claim: Original Claims submitted March 10, 2004

1. **A method** for improving the combustion efficiency of a combustion mechanism operating with fluid hydrocarbon fuel, having an ignition and combustion area therein to convert said fuel into heat, thrust, torque or other type of energy, resulting in the reduction of fuel consumption and harmful emissions without effecting performance output of the combustion mechanism, comprising:

a) providing a constant volume of ambient temperature fluid hydrocarbon fuel as fuel for said combustion mechanism;

b) directing said constant volume of fuel through a primary fuel supply conduit defining a fuel heat exchanger assembly that extends through a heating zone having a fuel inlet and a fuel outlet;

c) reducing fuel density by reducing fuel mass in said constant volume of fuel through heating the fuel to an optimal operating temperature of between 100 degrees Fahrenheit and the fuel's auto-ignition temperature as it flows through said fuel heat exchanger assembly;

d) maintaining a constant volume of heated low density fuel for ignition in the combustion area of said combustion mechanism;

e) providing a constant volume of ambient temperature air as combustion air for said combustion mechanism.

f) directing said constant volume of combustion air through a primary air supply conduit defining an air heat exchanger assembly that extends through a cooling zone having an air inlet and an air outlet.

g) increasing air density by increasing air mass in said constant volume of combustion air through cooling the combustion air to an optimal operating temperature of between combustion mechanism ambient temperature and minus 40 degrees Fahrenheit as it flows through said air heat exchanger assembly;

h) maintaining a constant volume of cooled high density air for combustion in the combustion-area of said combustion mechanism;

2. A method according to Claim 1, wherein the fuel heat exchanger assembly is operated with heat generated from the combustion mechanism.

3. A method according to Claim 1, wherein the fuel heat exchanger assembly is operated with means other than heat generated from the combustion mechanism.

4. A method according to Claim 1, wherein the preselected optimal fuel operating temperature level is at a constant range between 155 degrees Fahrenheit and 900 degrees Fahrenheit.

5. A method according to Claim 1, wherein the combustion air heat exchanger assembly is operated with low temperature generated from the flow of the low temperature fuel supply.

6. A method according to Claim 1, wherein the combustion air heat exchanger assembly is operated with means other than the flow of the low temperature fuel supply.

7. A method according to Claim 1, wherein the preselected optimal combustion air operating temperature level is maintained at a constant range between plus 30 and minus 40 degrees Fahrenheit.

8. A method according to Claim 1, wherein the combustion mechanism is a single or dual cycle power generator.

9. A method according to Claim 1, wherein the combustion mechanism is a combustion turbine.

10. A method according to Claim 1, wherein the combustion mechanism is a rotary kinetic fluid motor.

11. A method according to Claim 1, wherein at least one heat exchanger assembly is operational.

12. **A combination of devices** operational in accordance with the disclosed method for improving the combustion efficiency of a combustion mechanism operating with fluid hydrocarbon fuel, having an ignition and combustion area therein to convert said fuel into heat, thrust, torque or other type of energy, providing the means for the reduction of fuel consumption and harmful emissions without effecting performance output of the combustion mechanism, comprising:

a) a first housing means defining a heating zone;

b) a fuel supply conduit defining a fuel heat exchanger assembly extending through said heating zone, providing the primary conveyance of fuel to the combustion area of the combustion mechanism, having a fuel inlet and a fuel outlet

c) a fuel heat exchanger assembly to maintain a constant volume of low density fuel supply to the combustion area of said combustion mechanism at a preselected optimal operating temperature range of between 100 degrees Fahrenheit and the fuel's auto-ignition temperature;

d) means to maintain a constant volume of low density heated fuel for combustion in the combustion area of said combustion mechanism;

e) a second housing means defining a coling zone;

f) a combustion air supply conduit defining a combustion air heat exchanger assembly extending through said cooling zone, providing the primary conveyance of combustion air to the combustion area of the combustion mechanism, having an air inlet and an air outlet;

g) a combustion air heat exchanger assembly to maintain a constant volume of high density cooled combustion air supply to the combustion area of said combustion mechanism at a preselected optimal operating temperature range of between ambient and minus 40 degrees Fahrenheit;

h) means to maintain a constant volume of high density cooled air for combustion in the combustion area of said combustion mechanism.

13. A heating zone according to Claim 12, wherein the fuel heat exchanger assembly is operated with heat generated from the combustion mechanism.

14. A heating zone according to Claim 12, wherein the fuel heat exchanger assembly is operated with means other than heat generated from the combustion mechanism.

15. A fuel heat exchanger assembly in a heating zone according to Claim 12, designed to heat the fuel to a preselected optimal constant fuel operating temperature level of between 155 degrees Fahrenheit and 900 degrees Fahrenheit.

16. A cooling zone according to Claim 12, wherein the combustion air heat exchanger assembly is operated with low temperature generated from the flow of the low temperature fuel supply.

17. A cooling zone according to Claim 12, wherein the combustion air heat exchanger assembly is operated with means other than the low temperature of the fuel supply flow.

18. A combustion air heat exchanger assembly in a cooling zone according to Claim 14, designed to cool the combustion air to a preselected optimal constant combustion air operating temperature level of between plus 30 and minus 40 degrees Fahrenheit.

19. A combination of devices according to Claim 12, wherein the combustion mechanism is a single or dual cycle power generator.

20. A combination of devices according to Claim 12, wherein the combustion mechanism is a combustion turbine.

23. A combination of devices according to Claim 12, wherein the combustion mechanism is a rotary kinetic motor.

24. A combination of devices according to Claim 14, wherein at least one heat exchanger assembly is operational.

Claims 1 to 24 CANCELLED

Detailed Action dated 10/18/04 Response dated November 18, 2004

I claim:

25. (New) **A method** for reducing fuel density while increasing combustion air density, without effecting their specified volume, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels such as natural gas, propane gas and the like, in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into energy, such as heat, thrust or torque, comprising:

a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;

b) directing said fuel through the fuel supply conduit defining a first heat exchanger assembly that extends through a first heat transfer zone related to the combustion mechanism;

c) reducing the density of said fuel by heating the fuel as it flows through said first heat exchanger assembly to an optimal fuel operating temperature level ranging between 100 degrees Fahrenheit and the fuel's flash point or auto ignition level;

d) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;

e) providing combustion air for the combustion process in said combustion mechanism;

f) directing said combustion air through an air supply conduit defining a second heat exchanger assembly that extends through a second heat transfer zone of said combustion mechanism;

g) increasing the density of said combustion air by cooling the combustion air as it flows through said second heat exchanger assembly to an optimal air operating temperature level of between plus 50 and minus 25 degrees Fahrenheit;

h) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism.

26. (New) A method according to Claim 25, wherein the density reduction of the fuel is stabilised with an insulating or heat storage material forming part of the heat exchanger assemblies.

27. (New) A method according to Claim 25, wherein at least one of said heat transfer zones is related to the exhaust gas vent area of the combustion mechanism.

28. (New) A method according to Claim 25, wherein at least one of said heat transfer zones is related to the combustion area of the combustion mechanism.

29. (New) A method according to Claim 25, wherein said heat transfer zones are operated from a source other than the combustion or exhaust gas vent area of the combustion mechanism.

68. (New) A method according to Claim 25, wherein said preselected optimal fuel operating temperature range is within the preselected general fuel operating temperature range from 125 degrees to 900 degrees Fahrenheit.

30. (New) A method according to Claim 25, wherein the combustion mechanism converts the oxidation mixture of fuel and air into high temperature, high velocity combustion products to operate a single or dual cycle turbine system.

31. (New) A method according to Claim 25, wherein the combustion mechanism is part of a combustion turbine.

32. (New) A method according to Claim 25, wherein at least one of the two heat exchanger assemblies is operational.

33. (New) A method according to Claim 25, wherein the fluid hydrocarbon fuel includes a suspended coal dust, or a coal dust slurry.

34. (New) A method according to Claim 25, wherein the fluid hydrocarbon fuel includes a liquid fuel.

35. (New) **A device** for reducing fuel density while increasing combustion air density, without effecting their specified volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels such as natural gas, propane gas and the like, in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into energy, such as heat, thrust or torque, comprising:

a) a fuel supply conduit defining a first heat exchanger assembly located in a heating zone related to the combustion area of the mechanism, providing the means to maintain a constant supply of fluid hydrocarbon fuel to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between 100 degrees Fahrenheit and the fuel's flash point or auto ignition level;

b) a combustion air supply conduit defining a second heat exchanger assembly located in a cooling zone related to the combustion mechanism, providing the means to maintain a constant volume of combustion air to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between plus 50 and minus 25 degrees Fahrenheit.

36. (New) A device according to Claim 35, wherein an insulating material forms part of said heat exchanger assemblies in order to balance any temperature fluctuations occurring in the heat transfer zones.

37. (New) A device according to Claim 35, wherein at least one heat transfer zone is related to the exhaust gas vent area of the combustion mechanism.

38. (New) A device according to Claim 35, wherein at least one heat transfer zone is related to the combustion area of the combustion mechanism.

39. (New). A device according to Claim 35, wherein the heat transfer zones are related to an operating source other than the combustion or exhaust gas vent area of the combustion mechanism.

40. (New) A device according to Claim 35, wherein said means to maintain a continuous volume of fuel to the burners in the combustion area of the mechanism at said optimal fuel temperature level operates within a preselected operating temperature range between 125 degrees and 900 degrees Fahrenheit.

41. (New) A device according to Claim 35, wherein a preselected volume of combustion air is routed through a contained duct system which provides temperature control and the means for density increase of said combustion air volume by cooling the air to a preselected temperature range below ambient prior to combustion.

42. (New) A device according to Claim 35, which provides the means for the combustion mechanism to convert an oxidation mixture of fuel and air into high temperature, high velocity combustion products for the purpose of operating a related turbine system.

43. (New) A device according to Claim 35, wherein the fluid hydrocarbon fuel is a fuel other than natural gas or propane gas.

44. (New) A device according to Claim 35, wherein at least one of the two heat exchanger assemblies is operational.

Claims 23 to 44 (Cancelled) **Notice of Non-Compliant Amendment dated 04/26/05**

I claim: Response dated May 6, 2005

45. (New) **A method** for reducing fuel density while increasing combustion air density, without effecting their specified volume, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into heat, thrust, torque or other energy, comprising:

a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;

b) directing said fuel through the fuel supply conduit defining a first heat exchanger assembly that extends through a first heat transfer zone related to the combustion mechanism;

d) reducing the density of said fuel by heating the fuel as it flows through said first heat exchanger assembly to an optimal fuel operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

i) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;

j) providing combustion air for the combustion process in said combustion mechanism;

k) directing said combustion air through an air supply conduit defining a second heat exchanger assembly that extends through a second heat transfer zone;

l) increasing the density of said combustion air by cooling the combustion air as it flows through said second heat exchanger assembly to an optimal air operating temperature level of between ambient and minus 40 degrees Fahrenheit;

m) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism.

46. (New) A method according to Claim 45, wherein at least one of said heat transfer zones is related to the exhaust gas vent area of the combustion mechanism.

47. (New) A method according to Claim 45, wherein at least one of said heat transfer zones is related to the combustion area of the combustion mechanism.

48. (New) A method according to Claim 45, wherein at least one of the heat transfer zones is operated from a source other than the combustion or exhaust gas vent area of the combustion mechanism.

49. (New) A method according to Claim 45, wherein said preselected optimal fuel operating temperature range is within the preselected general fuel operating temperature range from 165 degrees to 900 degrees Fahrenheit.

50. (New) A method according to Claim 45, wherein the combustion mechanism converts the oxidation mixture of fuel and air into high temperature, high velocity combustion products to operate a single or dual cycle turbine system.

51. (New) A method according to Claim 45, wherein the combustion mechanism is part of a combustion turbine.

52. (New) A method according to Claim 45, wherein at least one of the two heat exchanger assemblies is operational.

53. (New) A method according to Claim 45, wherein the fluid hydrocarbon fuel is suspended coal dust, or a coal dust slurry.

54. (New) A method according to Claim 45, wherein the fluid hydrocarbon fuel is a liquid fuel.

55. (New) **A device** for reducing fuel density while increasing combustion air density, without effecting their specified volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into heat, thrust, torque or other energy comprising:

a) a fuel supply conduit defining a first heat exchanger assembly located in a heating zone related to the combustion area of the mechanism, providing the means to maintain a constant supply of fluid hydrocarbon fuel to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

b) a combustion air supply conduit defining a second heat exchanger assembly located in a cooling zone related to the combustion mechanism, providing the means to maintain a constant volume of combustion air to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between ambient and minus 40 degrees Fahrenheit.

56. (New) A device according to Claim 55, wherein at least one heat transfer zone is related to the exhaust gas vent area of the combustion mechanism.

57. (New) A device according to Claim 55, wherein at least one heat transfer zone is related to the combustion area of the combustion mechanism.

58. (New) A device according to Claim 55, wherein the heat transfer zones are related to an operating source other than the combustion or exhaust gas vent area of the combustion mechanism.

59. (New) A device according to Claim 55, wherein said means to maintain a continuous volume of fluid hydrocarbon fuel to the burners in the combustion area of the mechanism at said optimal fuel temperature level operates within a preselected operating temperature range between 165 degrees and 900 degrees Fahrenheit.

60. (New) A device according to Claim 55, wherein a preselected volume of combustion air is routed through a contained duct system which provides temperature control and the means for density increase of said combustion air volume by cooling the air to a preselected temperature range below ambient prior to combustion.

61. (New) A device according to Claim 55, which provides the means for the combustion mechanism to convert an oxidation mixture of fuel and air into high temperature, high velocity combustion products for the purpose of operating a related turbine system.

62. (New) A device according to Claim 55, wherein the fluid hydrocarbon fuel is a fluid fuel other than natural gas or propane gas.

63. (New) A device according to Claim 55, wherein the fluid hydrocarbon fuel is supended coal dust, or a coal dust slurry.

64. (New) A device according to Claim 55, wherein at least one of the two heat exchanger assemblies is operational.

Claims 1 to 64 (Cancelled) **Notice of Non-Compliant Amendment dated 06/03/05**

I claim: Response dated May 16, 2005

65. (New) **A method** for reducing fuel density while increasing combustion air density, without effecting their specified volume, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into heat, thrust, torque or other energy, comprising:

a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;

b) directing said fuel through the fuel supply conduit defining a first heat exchanger assembly that extends through a first heat transfer zone related to the combustion mechanism;

e) reducing the density of said fuel by heating the fuel as it flows through said first heat exchanger assembly to an optimal fuel operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

n) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;

o) providing combustion air for the combustion process in said combustion mechanism;

p) directing said combustion air through an air supply conduit defining a second heat exchanger assembly that extends through a second heat transfer zone;

q) increasing the density of said combustion air by cooling the combustion air as it flows through said second heat exchanger assembly to an optimal air operating temperature level of between ambient and minus 40 degrees Fahrenheit;

r) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism.

66. (New) A method according to Claim 65, wherein at least one of said heat transfer zones is related to the exhaust gas vent area of the combustion mechanism.

67. (New) A method according to Claim 65, wherein at least one of said heat transfer zones is related to the combustion area of the combustion mechanism.

68. (New) A method according to Claim 65, wherein at least one of the heat transfer zones is operated from a source other than the combustion or exhaust gas vent area of the combustion mechanism.

69. (New) A method according to Claim 65, wherein said preselected optimal fuel operating temperature range is within the preselected general fuel operating temperature range from 165 degrees to 900 degrees Fahrenheit.

70. (New) A method according to Claim 65, wherein the combustion mechanism converts the oxidation mixture of fuel and air into high temperature, high velocity combustion products to operate a single or dual cycle turbine system.

71. (New) A method according to Claim 65, wherein the combustion mechanism is part of a combustion turbine.

72. (New) A method according to Claim 65, wherein at least one of the two heat exchanger assemblies is operational.

73. (New) A method according to Claim 65, wherein the fluid hydrocarbon fuel is suspended coal dust, or a coal dust slurry.

74. (New) A method according to Claim 65, wherein the fluid hydrocarbon fuel is a liquid fuel.

75. (New) **A device** for reducing fuel density while increasing combustion air density, without effecting their specified volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into heat, thrust, torque or other energy comprising:

a) a fuel supply conduit defining a first heat exchanger assembly located in a heating zone related to the combustion area of the mechanism, providing the means to maintain a constant supply of fluid hydrocarbon fuel to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

b) a combustion air supply conduit defining a second heat exchanger assembly located in a cooling zone related to the combustion mechanism, providing the means to maintain a constant volume of combustion air to the combustion area of said mechanism at a preselected optimal operating temperature level ranging between ambient and minus 40 degrees Fahrenheit.

76. (New) A device according to Claim 75, wherein at least one heat transfer zone is related to the exhaust gas vent area of the combustion mechanism.

77. (New) A device according to Claim 75, wherein at least one heat transfer zone is related to the combustion area of the combustion mechanism.

78. (New) A device according to Claim 75, wherein the heat transfer zones are related to an operating source other than the combustion or exhaust gas vent area of the combustion mechanism.

79. (New) A device according to Claim 75, wherein said means to maintain a continuous volume of fluid hydrocarbon fuel to the burners in the combustion area of the mechanism at said optimal fuel temperature level operates within a preselected operating temperature range between 165 degrees and 900 degrees Fahrenheit.

80. (New) A device according to Claim 75, wherein a preselected volume of combustion air is routed through a contained duct system which provides temperature control and the means for density increase of said combustion air volume by cooling the air to a preselected temperature range below ambient prior to combustion.

81. (New) A device according to Claim 75, which provides the means for the combustion mechanism to convert an oxidation mixture of fuel and air into high temperature, high velocity combustion products for the purpose of operating a related turbine system.

82. (New) A device according to Claim 75, wherein the fluid hydrocarbon fuel is a fluid fuel other than natural gas or propane gas.

83. (New) A device according to Claim 75, wherein the fluid hydrocarbon fuel is supended coal dust, or a coal dust slurry.

84. (New) A device according to Claim 75, wherein at least one of the two heat exchanger assemblies is operational.